WHAT IS CLAIMED IS:

1. A method for measuring one or more characteristics of ion implantation in a substrate, said method comprising:

before implantation:

directing non-destructive light onto a quiescent substrate at a first set of one or more measurement points to thereby cause light reflection by the substrate; and

detecting said light reflection;

after implantation:

directing non-destructive light onto the substrate at the first set of one or more measurement points to thereby cause light reflection by the substrate; and

detecting said light reflection; and

correlating the detected light reflection before implantion to the detected light reflection after implantion to obtain one or more differential measurement values each associated with a corresponding measurement point and indicative of an implantation characteristic of the substrate at said corresponding measurement point.

2. The method of Claim 1, wherein the substrate is a 200 mm semiconductor wafer and the number of measurement points is 37,700.

3. The method of Claim 1, wherein the substrate is a 300 mm semiconductor wafer and the number of measurement points is 87,700.

4. The method of Claim 2, wherein the scanning and detecting before implantation are performed in about 3 minutes.

5. The method of Claim 2, wherein the scanning and detecting after implantation are performed in about 3 minutes.

6. The method of Claim 3, wherein the scanning and detecting before implantation are performed in about 5 minutes.

7. The method of Claim 3, wherein the scanning and detecting after implantation are performed in about 5 minutes.

8. The method of Claim 1, wherein the substrate is a flat panel display.

9. The method of Claim 1, wherein the light is directed at the substrate in accordance with a scanning pattern comprising a set of concentric circles spaced by a radial distance of about 1 mm.

10. The method of Claim 1, wherein the light is from a light source comprising one or more LEDs.

11. The method of Claim 1, wherein the substrate is a semiconductor wafer without features.

12. The method of Claim 1, wherein the substrate is a semiconductor wafer having features fabricated thereon.

13. The method of Claim 1, wherein the light comprises non-coherent polychromatic light.

14. The method of Claim 10, wherein the light comprises non-coherent polychromatic light.

15. The method of Claim 1, wherein the one or more characteristics include any of dopant concentration, dose, energy and depth.

16. A method for generating an implantation characteristic profile of a quiescent substrate, the method comprising:

non-destructively illuminating the quiescent substrate at a plurality of measurement points prior to implantation;

for each illuminated measurement point prior to implantation, detecting spectral distribution and intensity of reflected light;

non-destructively illuminating the quiescent substrate at a plurality of measurement points after implantation;

for each illuminated measurement point after implantation, detecting spectral distribution and intensity of reflected light; and

generating a map of differential measurement values each associated with a corresponding measurement point and indicative of an implantation characteristic of the substrate at said corresponding measurement point.

17. The method of Claim 16, wherein the substrate is a 200 mm semiconductor wafer and the number of measurement point is 37,700.

18. The method of Claim 16, wherein the substrate is a 300 mm semiconductor wafer and the number of measurement points is 87,700.

19. The method of Claim 17, wherein the scanning and detecting prior to implantation are performed in about 3 minutes.

20. The method of Claim 17, wherein the scanning and detecting after implantation are performed in about 3 minutes.

21. The method of Claim 18, wherein the scanning and detecting prior to implantation are performed in about 5 minutes.

22. The method of Claim 18, wherein the scanning and detecting after implantation are performed in about 5 minutes.

23. The method of Claim 16, wherein the substrate is a flat panel display.

24. The method of Claim 16, wherein illumination light is directed at the substrate in accordance with a scanning pattern comprising a set of concentric circles spaced by a radial distance of about 1 mm.

25. The method of Claim 16, wherein illumination is from a light source comprising one or more LEDs.

26. The method of Claim 16, wherein the substrate is a semiconductor wafer without features.

27. The method of Claim 16, wherein the substrate is a semiconductor wafer having features fabricated thereon.

28. The method of Claim 16, wherein illumination is from a non-coherent polychromatic light source.

29. The method of Claim 25, wherein illumination is from a non-coherent polychromatic light source.

30. The method of Claim 16, wherein the implantation characteristic profile relates to any of dopant concentration, dose, energy, and depth.

31. A device for non-destructively measuring dopant concentration in a substrate, comprising:

a light source;

a light detector generating a detection signal in response to light impinging thereon;

an optical system directing light from the light source to an illumination area on the substrate, and directing light reflected by the substrate from the illumination area onto the light detector;

a stage for relatively moving the substrate and the illumination area in first and second scanning patterns;

a processor which, during the first scanning pattern, obtains from the light detector a first set of detection signals each corresponding to a measurement point on the substrate, and during the second scanning pattern, obtains from the light detector a second set of detection signals each corresponding to each of said measurement points, such that for each measurement point, a pair of detection signals are obtained, the processor further generating a set of differential measurement values each derived from one of said pair of detection signals, said set of differential measurement values being indicative of implantation characteristic levels in the substrate, including any of dopant concentration, dose, energy, and depth.

32. The device of Claim 31, wherein the substrate is a 200 mm semiconductor wafer and the number of measurement point is 37,700.

33. The device of Claim 31, wherein the substrate is a 300 mm semiconductor wafer and the number of measurement point is 87,700.

34. The device of Claim 32, wherein the first scanning pattern is performed in about 3 minutes.

35. The device of Claim 32, wherein the second scanning is performed in about 3 minutes.

36. The device of Claim 33, wherein the first scanning pattern is performed in about 5 minutes.

37. The device of Claim 33, wherein the second scanning pattern is performed in about 5 minutes.

38. The device of Claim 31, wherein the substrate is a flat panel display and wherein the first and second pattern are linear.

39. The device of Claim 31, wherein the first and second scanning patterns each comprises a set of concentric circles spaced by a radial distance of about 1 mm.

40. The device of Claim 31, wherein the light source comprises one or more LEDs.

41. The device of Claim 31, wherein the substrate is a semiconductor wafer without features.

42. The device of Claim 37, wherein the substrate is a semiconductor wafer having features fabricated thereon.

43. The device of Claim 31, wherein the light source emits non-coherent polychromatic light.

44. The device of Claim 40, wherein the LEDs emit non-coherent polychromatic light.

45. A method for characterizing a substrate, comprising:

directing non-destructive light onto a surface of a substrate in a quiescent state at a plurality of measurement points on the substrate to thereby cause light reflection by the substrate;

detecting light reflected from the substrate at the plurality of measurement points; and

using the detected reflected light to generate a map indicative of relative reflectivity across the surface of the substrate.

46. The method of Claim 45, further comprising determining implantation characteristic levels in the substrate, including any of dopant concentration, dose, energy and depth, based on said map.

47. The method of Claim 45, wherein the substrate is a semiconductor wafer having features formed thereon.

48. The method of Claim 45, wherein the substrate is a semiconductor wafer without features.

49. The method of Claim 45, wherein the substrate is ion implanted.

50. The method of Claim 45, wherein the substrate surface includes a thin film.

51. The method of Claim 45, wherein the number of measurement points is 37,700.

52. The method of Claim 45, wherein the number of measurement points is 87,700.

53. The method of Claim 45, wherein the light is non-coherent polychromatic light.

54. The method of Claim 45, wherein the light is non-coherent monochromatic light.

55. A method for measuring low energy ion implantation dosage in a bare silicon test wafer implanted using plasma doping (PLAD) implantation, said method comprising:

directing non-destructive light onto the test wafer to thereby cause light reflection from the wafer;

detecting said light reflection; and

correlating the detected light reflection to ion implantation dosage based on a comparison with reflection characteristics of a bare silicon wafer background standard.

56. The method of Claim 55, wherein the wafer is a 200 mm semiconductor wafer.

57. The method of Claim 55, wherein the wafer is a 300 mm semiconductor wafer.

58. The method of Claim 55, wherein the light is from a light source comprising one or more LEDs.

59. The method of Claim 55, wherein the light comprises non-coherent polychromatic light.

60. A method for measuring low energy ion implantation dosage in a thin oxide-coated silicon test wafer implanted using plasma doping (PLAD) implantation, said method comprising:

directing non-destructive light onto the test wafer to thereby cause light reflection from the wafer;

detecting said light reflection; and

correlating the detected light reflection to ion implantation dosage based on a comparison with reflection characteristics of a thin oxide-coated silicon wafer background standard.